Toxicology in Vitro

An international journal published in association with BIBRA

Volume 7 1993

List of Contents

Pergamon

TOXICOLOGY IN VITRO

An international journal published in association with BIBRA

Joint Editors

SHARAT D. GANGOLLI
Medical Research Council, Toxicology Unit, Hodgkin Building, University of Leicester, P.O. Box 138, Lancaster Road, Leicester LE1 9HN, UK

IAIN F. H. PURCHASE
Zeneca Central Toxicology Laboratory, Alderley Park, Macclesfield, Cheshire SK10 4TJ, UK

Associate Editor
DANIEL ACOSTA
Department of Pharmacology and Toxicology, College of Pharmacy, University of Texas, Austin, TX 78712, USA

Review Editor
PHILIP A. BOTHAM
Zeneca Central Toxicology Laboratory, Alderley Park, Macclesfield, Cheshire, SK10 4TJ, UK

Managing Editor
TUAN HÔ
BIBRA Toxicology International, Woodmansterne Road, Carshalton, Surrey SM5 4DS, UK

Editorial Assistant
STELLA HILL
BIBRA Toxicology International Woodmansterne Road, Carshalton, Surrey SM5 4DS, UK

International Editorial Board

J. C. Barrett
NIEHS, Research Triangle Park
NC, USA

E. Borenfreund
Rockefeller University
New York, NY, USA

J. Bradlaw
FDA
Washington, DC, USA

N. Brown
St George's Hospital and Medical School
London, UK

B. Ekwall
University of Uppsala
Uppsala, Sweden

R. Fahrig
Fraunhofer-Institut für Toxikologie und Aerosol-Forschung
Hannover, Germany

J. L. Farber
Thomas Jefferson University
Philadelphia, PA, USA

H. R. Glatt
University of Mainz
Mainz, Germany

T. J. B. Gray
Sterling–Winthrop Research Centre
Alnwick, UK

A. Guillouzo
Hôpital de Pontchaillou
INSERM, Rennes, France

G. C. Hard
American Health Foundation
Valhalla, NY, USA

C. A. McQueen
University of Arizona
Tucson, AZ, USA

P. Maier
Swiss Federal Institute of Technology and University of Zurich
Schwerzenbach, Switzerland

M. Nagao
National Cancer Center Research Institute
Tokyo, Japan

K. Onozaki
Nagoya City University
Nagoya, Japan

W. E. Parish
Unilever Research
Bedford, UK

J. A. Popp
Sterling Winthrop Inc.,
Collegeville, PA, USA

N. Stacey
National Institute of Occupational Health and Safety
Sydney, Australia

K. A. Stitzel
The Procter & Gamble Company
Cincinnati, OH, USA

H. Tahti
University of Tampere
Tampere, Finland

P. J. van Bladeren
TNO–CIVO Institute
Zeist, The Netherlands

E. Walum
University of Stockholm
Stockholm, Sweden

F. Zucco
Consiglio Nazionale Delle Ricerche
Rome, Italy

Publishing Office
Pergamon Press Ltd, Pergamon House, Bampfylde Street, Exeter EX1 2AH, UK
[*Tel.* Exeter (0392) 51558; *Fax* (0392) 425370]

Production Editor: Nigel Stoneman

Subscription and Advertising Offices
Pergamon Press Ltd, Headington Hill Hall, Oxford OX3 0BW, UK
[*Tel.* Oxford (0865) 794141; *Fax* (0865) 60285]
Pergamon Press Inc., 660 White Plains Road, Tarrytown, NY 10591-5153, USA

Subscription Rates
Annual Institutional Subscription Rates (1994): North, Central and South America, US$400, Rest of the World £260. Sterling prices exclude VAT. Non-VAT registered customers in the European Community will be charged the appropriate VAT in addition to the price listed. Prices include postage and insurance and are subject to change without notice.

Back Issues
Back issues of all previously published volumes, in both hard copy and in microform are available direct from Pergamon Press offices.

Published 6 issues/annum in January, March, May, July, September and November

Copyright © 1993 Pergamon Press Ltd

Second class postage paid at RAHWAY, NJ. Postmaster send address corrections to *Toxicology in Vitro*, c/o Pergamon Press Inc., 660 White Plains Road, Tarrytown, NY 10591-5153, USA

LIST OF CONTENTS

VOLUME 7 NUMBER 1

M. Andersson, F. Bocchio, O. Sterner, A. Forsby and L. Lewan — 1 Structure–activity relationships for unsaturated dialdehydes 7. The membrane toxicity of 15 sesquiterpenoids measured as the induction of ATP leakage in ELD cells. The correlation of the activity with structural descriptors by the multivariate PLS method

S. Endo-Capron, A. Renier, X. Janson, L. Kheuang and M. C. Jaurand — 7 *In vitro* response of rat pleural mesothelial cells to talc samples in genotoxicity assays (sister chromatid exchanges and DNA repair)

A. Gueniche and M. Ponec — 15 Use of human skin cell cultures for the estimation of potential skin irritants

M. Gülden — 25 *In vitro* toxicity screening using cultured rat skeletal muscle cells. I. Surfactants and mitochondrial poisons

S. Hagino, H. Itagaki, S. Kato and T. Kobayashi — 35 Further evaluation of the quantitative chorioallantoic membrane test using trypan blue stain to predict the eye irritancy of chemicals

K. Herrmann — 41 Effects of the anticonvulsant drug valproic acid and related substances on the early development of the zebrafish (*Brachydanio rerio*)

P. Jégo, N. Hubert, R. Moirand, I. Morel, N. Pasdeloup, A. Ocaktan, M. Abdallah, P. Brissot and G. Lescoat — 55 Inhibition of iron toxicity in rat hepatocyte cultures by pyoverdin Pa A, the peptidic fluorescent siderophore of *Pseudomonas aeruginosa*

T. Kondo, S. Takahashi, H. Sato, M. Yamada, T. Kikuchi and K. Furuya — 61 Cytotoxicity of size–density fractionated coal fly ash in rat alveolar macrophages cultured *in vitro*

A. M. Pillar, H. B. Jones, J. E. Dunnage, C. K. Atterwill and A. K. Prince — 69 Effects of the neurotoxin ethylcholine mustard aziridinium in rat brain reaggregate cultures

J. J. M. van de Sandt, A. A. J. J. L. Rutten and H. B. W. M. Koëter — 81 Cutaneous toxicity testing in organ culture: neutral red uptake and reduction of tetrazolium salt (MTT)

Brief Communication

C. Massart, C. Le Tellier, J. Gibassier, G. Leclech and M. Nicol — 87 Modulation by dimethyl sulphoxide of the toxicity induced by *cis*-diamminedichloroplatinum in cultured thyrocytes

Review Paper

W. W. Lovell — 95 A scheme for *in vitro* screening of substances for photoallergenic potential

Forthcoming Papers — 103

VOLUME 7 NUMBER 2

H. Babich, A. Stern and E. Borenfreund — 105 Eugenol cytotoxicity evaluated with continuous cell lines

F. A. Barile, S. Arjun and D. Hopkinson 111 *In vitro* cytotoxicity testing: biological and statistical significance

K. Cain and J. A. Gurney 117 Isolation and purification of proximal kidney cells by centrifugal elutriation

J. A. Charlton and N. L. Simmons 129 Established human renal cell lines: phenotypic characteristics define suitability for use in *in vitro* models for predictive toxicology

A. Ghosh, A. Sharma and G. Talukder 137 Clastogenic effects of caesium chloride on human peripheral blood lymphocytes *in vitro*

S. A. M. Hotchkiss, P. Hewitt and J. Caldwell 141 Percutaneous absorption of 4,4′-methylene-bis(2-chloroaniline) and 4,4′-methylenedianiline through rat and human skin *in vitro*

T. Husøy, T. Syversen and J. Jenssen 149 Comparisons of four *in vitro* cytotoxicity tests: the MTT assay, NR assay, uridine incorporation and protein measurements

R. W. Lewis, J. C. McCall and P. A. Botham 155 A comparison of two cytotoxicity tests for predicting the ocular irritancy of surfactants

A. Lorenzen, C. A. James and S. W. Kennedy 159 Effects of UV irradiation of cell culture medium on PCB-mediated porphyrin accumulation and EROD induction in chick embryo hepatocytes

R. P. Moody and B. Nadeau 167 An automated *in vitro* dermal absorption procedure: III. *In vivo* and *in vitro* comparison with the insect repellent *N,N*-diethyl-*m*-toluamide in mouse, rat, guinea pig, pig, human and tissue-cultured skin

C. L. Parker, R. B. Finley, B. G. Wright, R. Nzeribe and J. Stewart 177 The inhibitory effects of pentamidine on biochemical events in human liver cells

A. Seelbach, B. Fissler, A. Strohbusch and S. Madle 185 Development of a modified micronucleus assay *in vitro* for detection of aneugenic effects

Forthcoming Papers 195

VOLUME 7 NUMBER 3

C. L. Bai and N. H. Stacey 197 Effects of carbon tetrachloride and chloroform on bile acid transport in isolated rat hepatocytes: relationship to elevated serum bile acids

J. Bergquist, C. Strandberg, M. Andersson, O. Sterner, D. Pesando and J.-P. Girard 205 Structure–activity relationships for unsaturated dialdehydes 8. Comparative effects of 10 sesquiterpenoids on the sea urchin gamete fertilization

D. E. Chapman, S. R. Michener and G. Powis 213 *In vitro* metabolism of [^{3}H]2,6-dinitrotoluene by human and rat liver

M. F. Hughes, S. P. Shrivastava, H. L. Fisher and L. L. Hall 221 Comparative *in vitro* percutaneous absorption of *p*-substituted phenols through rat skin using static and flow-through diffusion systems

H. B. Johnston, S. M. Thomas and C. K. Atterwill 229 Aluminium and iron induced metabolic changes in neuroblastoma cell lines and rat primary neural cultures

V. Kefalas and N. H. Stacey 235 Use of primary cultures of rat hepatocytes to study interactive toxicity: carbon tetrachloride and trichloroethylene

U. Mårtensson and L. Nässberger 241 Influence of antidepressants on mitogen stimulation of human lymphocytes

G. D. C. Terlouw and R. Bechter 247 Cytochrome *P*-450-dependent biotransformation of QA 208-199 in cultured rat conceptuses

M. Usami, K. Sakemi, H. Tabata, K. Kawashima and A. Takanaka 259 Developmental toxicity of 2-chlorodibenzofuran in cultured post-implantation rat embryos

E. Whittle and D. A. Basketter 265 The *in vitro* skin corrosivity test. Development of method using human skin

E. Whittle and D. A. Basketter 269 The *in vitro* skin corrosivity test. Comparison of *in vitro* human skin with *in vivo* data

K. Xie and A. L. Harvey 275 Evaluation of nerve cell toxicity *in vitro* by electrophysiological and biochemical methods

Brief Communications

R. Bechter and G. D. C. Terlouw 281 Strain differences in the control incidences of morphological abnormalities in the rat whole embryo culture

K. M. Brown and G. J. Burin 285 Cocaine-mediated disruption of microfilament integrity within neural-fold neuroepithelial cells of chick embryos cultured *in vitro*

Forthcoming Papers 291

VOLUME 7 NUMBER 4

SEVENTH INTERNATIONAL WORKSHOP ON IN VITRO TOXICOLOGY

Diane J. Benford, Bas J. Blaauboer and Christoph A. Reinhardt 293 Introduction

Immunotoxicology

I. Kimber 295 Epidermal cytokines in contact hypersensitivity: immunological roles and practical applications

O. de Silva, M. J. Perez, N. Pineau, A. Rougier and K. G. Dossou 299 Local lymph node assay: study of the *in vitro* proliferation and control of the specificity of the response by FACScan analysis

R. Fautz and H. G. Miltenburger 305 Immunotoxicity screening *in vitro* using an economical multiple endpoint approach

F. N. A. M. van Pelt, T. L. Knight and J. G. Kenna 311 Generation of trifluoroacetylated protein antigens in cultured rat hepatocytes exposed to halothane *in vitro*

F. Verdier, F. Condevaux, R. Tedone, M. Virat and J. Descotes 317 *In vitro* assessment of phagocytosis: interspecies comparison of chemiluminescence response

Neurotoxicology

E. Walum, M. Nordin, M. Beckman and L. Odland 321 Cellular methods for identification of neurotoxic chemicals and estimation of neurotoxicological risk

M. Oortgiesen, R. Zwart, R. G. D. M. van Kleef and H. P. M. Vijverberg 327 Nicotinic acetylcholine receptors in cultured cells as targets of neurotoxic compounds

F. Monnet-Tschudi, M.-G. Zurich and P. Honegger 335 Evaluation of the toxicity of different metal compounds in the developing brain using aggregating cell cultures as a model

E. M. Abdulla and I. C. Campbell 341 L-BMAA and kainate-induced modulation of neurofilament concentrations as a measure of neurite outgrowth: implications for an *in vitro* test of neurotoxicity

N. Safran, A. Shainberg, R. Haring, D. Gurwitz and A. Shahar 345 Selective neurotoxicity induced by lasalocid in dissociated cerebral cultures

G. Repetto, P. Sanz and M. Repetto 353 *In vitro* effects of mercuric chloride and methylmercury chloride on neuroblastoma cells

Lung Toxicology

B. Nemery and P. H. M. Hoet 359 Use of isolated lung cells in pulmonary toxicology

W. Hadnagy, N. H. Seemayer, A. Happel and A. Kiell 365 Human monocyte-derived macrophage cultures: an alternative test system for the detection of pulmonary toxicity induced by inhaled particulate pollutants

S. Romet-Haddad, A. C. Dazy, C. Guennou and F. Marano 373 Measurement of the epithelial barrier integrity in tracheal cell cultures exposed to irritant compounds

Skin Toxicology

F. M. Dickson, J. N. Lawrence and D. J. Benford 381 Surfactant-induced cytotoxicity in cultures of human keratinocytes and a commercially available cell line (3T3)

F. M. Dickson, J. N. Lawrence and D. J. Benford 385 Release of inflammatory mediators in human keratinocyte cultures following exposure to a skin irritant

W. J. W. Pape, J. Degwert, F. Steckel and U. Hoppe 389 Immunocompetent cells for *in vitro* screening of skin irritation

R. W. Lewis, J. C. McCall, P. A. Botham and I. Kimber 393 Investigation of the TNF-α release as a measure of skin irritancy

Intestinal Toxicology

F. Zucco 397 Freshly isolated cells and cell lines from the intestine as an *in vitro* model for toxicological studies

O. Vincentini, I. De Angelis, A. Stammati and F. Zucco 403 Functional alterations induced by the food contaminant furazolidone on the human tumoral intestinal cell line Caco-2

Kidney Toxicology

H. McGlynn and M. P. Ryan 407 *In vitro* mechanisms and models of gentamicin nephrotoxicity

H. F. Bjerregaard 411 Electrophysiological measurements of a toad renal epithelial cell line (A6) as an assay to evaluate cellular toxicity *in vitro*

B. L'Azou and J. Cambar 417 Prevention of cyclosporin-induced vasoconstrictive effect in rat isolated glomeruli with pharmacological vasoactive agents

H. Hildebrand, F. W. Falkenberg, S. Schwengberg, G. Schlüter and E. Bomhard 421 Preparation and characterization of a mouse monoclonal antibody against a rat kidney papillary antigen

Liver Toxicology

P. Bouis, F. Bieri, B. Lang, H. Thomas and F. Waechter 427 Effect of propaquizafop and its free-acid derivative on lauric acid hydroxylation and peroxisomal β-oxidation in primary cultured rat, mouse, guinea pig and marmoset hepatocytes

P. Kremers, L. Roelandt, A. Todaro, N. Stouvenakers, M. Louvet, G. Goffinet and J. P. Thome 433 Use of cultured hepatocytes as an alternative method to study the effects of PCBs on living organisms

K. Mertens, V. Rogiers and A. Vercruysse 439 Measurement of malondialdehyde in cultures of adult rat hepatocytes

M. J. M. Toussaint, Th. A. Niewold and M. M. L. de Wit 443 Effects of cytokines, bacterial endotoxin and hydrocortisone on primary hepatocyte cultures of rat and hamster

J. Cao, E. Leibold, W. Beisker, T. Schranner, M. Nüsse and L. R. Schwarz 447 Flow cytometric analysis of *in vitro* micronucleus induction in hepatocytes treated with carcinogens

C. Guery, J. P. Stepniewski, B. Vannier, R. Fournex and G. Lorenzon 453 Long-term culture of rat hepatocytes on porous membranes in hormonally defined serum-free medium

Eye Toxicology

M. Berry and D. L. Easty 461 Isolated human and rabbit eye: models of corneal toxicity

P. Catroux, A. Rougier, K. G. Dossou and M. Cottin 465 The silicon microphysiometer for testing ocular toxicity *in vitro*

Ph. Vanparys, Gh. Deknudt, M. Sysmans, G. Teuns, W. Coussement and H. Van Cauteren 471 Evaluation of the bovine corneal opacity–permeability assay as an *in vitro* alternative to the Draize eye irritation test

Biotransformation

M. Akrawi, E. A. Shephard, I. R. Phillips, A. Vercruysse and V. Rogiers 477 Effects of phenobarbital and valproate on the expression of cytochromes *P*-450 in co-cultured rat hepatocytes

M. T. Donato, E. Herrero, M. J. Gómez-Lechón and J. V. Castell 481 Inhibition of monooxygenase activities in human hepatocytes by interferons

S. Coecke, A. Segaert, A. Vercruysse and V. Rogiers 487 Expression of flavin-containing monooxygenase activity in adult rat hepatocytes under various culture conditions

J.-M. Begue, P. Koch, G. Maurer and A. Guillouzo 493 Maintenance of the biotransformation capacity by cultured human hepatocytes after several daily exposures to drugs

J.-F. Dauphin, C. Graviere, D. Bouzard, S. Rohou, C. Chesne and A. Guillouzo 499 Comparative metabolism of tosufloxacin and BMY 43748 in hepatocytes from rat, dog, monkey and man

Validation

H. Spielmann, S. Kalweit, M. Liebsch, T. Wirnsberger, I. Gerner, E. Bertram-Neis, K. Krauser, R. Kreiling, H. G. Miltenburger, W. Pape and W. Steiling 505 Validation study of alternatives to the Draize eye irritation test in Germany: cytotoxicity testing and HET–CAM test with 136 industrial chemicals

E. Fortunati, P. Debetto, S. Borella and V. Bianchi 511 Inhibition of cell growth and alteration of cytosolic calcium levels in the cytotoxicity evaluation of nine MEIC chemicals

S. Wakuri, J. Izumi, K. Sasaki, N. Tanaka and H. Ono 517 Cytotoxicity study of 32 MEIC chemicals by colony formation and ATP assays

Miscellaneous

M. A. Miranda, J. V. Castell, M. J. Gómez-Lechón and L. A. Martinez 523 *In vitro* photoperoxidation as an indicator of the potential photo-toxicity of non-steroidal anti-inflammatory 2-arylpropionic acids

P. J. Dierickx 527 Correlation between the reduction of protein content in cultured FHM fish cells and fish lethality data

B. Marczynski, A. B. Czuppon, G. H. Schreiber, W. Marek and X. Baur 531 DNA double-strand breaks and apoptosis after *in vitro* exposure to toluene diisocyanate

H. Segner and D. Lenz 537 Cytotoxicity assays with the rainbow trout R_1 cell line

M. Rosenbruch, J. Kniepen and C. Weishaupt 541 The early chick embryo as a model to evaluate cardiovascular effects of adrenaline and nicotine

G. E. R. Schoeters, F. Vander Plaetse, H. Leppens and R. Van Den Heuvel 547 Response of murine stromal bone marrow cultures to α-particle irradiation *in vivo* and *in vitro* at osteosarcomogenic α-radiation doses

J. Heuer, S. Bremer, I. Pohl and H. Spielmann 551 Development of an *in vitro* embryotoxicity test using murine embryonic stem cell cultures

Announcements 557

Forthcoming Papers 558

VOLUME 7 NUMBER 5

C. L. Galli, B. Viviani and M. Marinovich 559 Cell cultures: a tool for the study of mechanisms of toxicity

C. K. Atterwill, J. Davenport-Jones, S. Goonetilleke, H. Johnston, W. Purcell, S. M. Thomas, M. West and S. Williams 569 New models for the *in vitro* assessment of neurotoxicity in the nervous system and the preliminary validation stages of a 'tiered-test' model

G. Ciabattoni, P. Montuschi, D. Curró and P. Preziosi 581 *In vitro* testing for lung toxicity

A. M. Brady, R. L. Hasmall and B. M. Elcombe 587 Comparison of the effects of griseofulvin and dihydropyridines on ferrochelatase activity and porphyrin accumulation in primary cultures of mouse and rat hepatocytes

N. Giladi, M. Sutton, B. Lo, S. Przedborski, S. Fahn and J. L. Cadet 595 Toxicity of the specific antimuscarinic agent methoctramine and other non-specific anticholinergic drugs in human neuroblastoma cell lines *in vitro*

B. G. Lake, D. F. V. Lewis, T. J. B. Gray and J. A. Beamand 605 Structure–activity relationships for induction of peroxisomal enzyme activities in primary rat hepatocyte cultures

A. H. Piersma, A. S. Haakmat and A. M. Hagenaars 615 *In vitro* assays for the developmental toxicity of xenobiotic compounds using differentiating embryonal carcinoma cells in culture

H. Roche and G. Bogé 623 Effects of Cu, Zn and Cr salts on antioxidant enzyme activities *in vitro* of red blood cells of a marine fish *Dicentrarchus labrax*

L. E. Roseng and E. Rivedal 631 TPA inhibition of gap junctional intercellular communication in Syrian hamster embryo cells through two different pathways

L. E. Roseng, E. Rivedal and T. Sanner 637 Effect of protein kinase C inhibitors on TPA-induced inhibition of gap junctional intercellular communication and induction of transformed morphology in Syrian hamster embryo cells

M. A. Tirmenstein 645 Comparative metabolism of bis(2-methoxyethyl) ether by rat and human hepatic microsomes: formation of 2-methoxyethanol

M. T. Weiss and T. W. Sawyer 653 Cytotoxicity of the MEIC test chemicals in primary neurone cultures

Brief Communications

J. C. Cubria, R. Balaña Fouce, Al. Ortiz, M. L. Alvarez-Bujidos and D. Ordoñez 669 Selective inhibition of mammalian diamine oxidase by aquatic biotoxins

N. Sato, K. Fujii and O. Yuge 673 Pentane formation and changes in fatty acid composition accompanying lipid peroxidation induced by carbon tetrachloride in guinea pig liver microsomes

Announcements 677

Forthcoming Papers 677

VOLUME 7 NUMBER 6

THIRD SYMPOSIUM: VERTEBRATE WHOLE EMBRYO CULTURE

R. Bechter vii Preface

Session 1: Developmental Aspects

A. J. Copp, A. S. W. Shum and F. A. Brook 679 Analysis of neural tube defects in a mouse mutant using whole embryo culture

C. Jones, B. Greiner, F. Wächter, G. D. C. Terlouw and R. Bechter 685 An immunohistochemical investigation into the presence and localization of cytochrome *P*-450 isozymes in organogenesis-stage rat conceptal tissue

C. V. Barber, M. B. Carda and A. G. Fantel 695 A new technique for culturing rat embryos between gestation days 14 and 15

Session 2: Methodological Aspects

R. Bellairs 701 Endpoints in the development of chick embryos

H. Ninomiya, K. Kishida, Y. Ohno, K. Tsurumi and K. Eto 707 Effects of trypan blue on rat and rabbit embryos cultured *in vitro*

G. Van Maele-Fabry, F. Delhaise, F. Gofflot and J. J. Picard 719 Developmental table of the early mouse post-implantation embryo

Session 3A: Teratological/Toxicological Aspects—Mechanisms

S. Klug and D. Neubert 727 The use of whole embryo culture to elucidate teratogenic mechanisms

D. K. Hansen 735 *In vitro* effects of folate derivatives on valproate-induced neural tube defects in mouse and rat embryos

L. A. G. J. M. van Aerts, H. H. Klaasboer, N. S. Postma, J. C. L. M. Pertijs, J. H. J. Copius Peereboom, T. K. A. B. Eskes and J. Noordhoek 743 Stereospecific *in vitro* embryotoxicity of L-homocysteine in pre- and post-implantation rodent embryos

D. Lison, G. Van Maele-Fabry, F. Gofflot, J. J. Picard and R. Lauwerys 751 Effects of retinoic acid, auranofin and mercuric chloride on plasminogen activator activity in post-implantation cultured mouse embryos

J. E. Andrews, M. Ebron-McCoy, R. J. Kavlock and J. M. Rogers 757 Lowering pH increases embryonic sensitivity to formate in whole embryo culture

Session 3B: Teratological/Toxicological Aspects—Validation Studies, Industrial Applications

A. H. Piersma 763 Whole embryo culture and toxicity testing

L. A. G. J. M. van Aerts, S. J. M. Hahné, A. G. M. Oostendorp, J. C. L. M. Pertijs, P. H. S. Fijneman, R. P. Bos, J. H. J. Copius Peereboom and J. Noordhoek 769 Sex difference in Aroclor 1254 induction of rat hepatocytes: consequences for *in vitro* embryotoxicity and mutagenicity of cyclophosphamide

E. Giavini, M. L. Broccia, E. Menegola and M. Prati 777 Comparative *in vitro* study of the embryotoxic effects of three glycol ethers and their metabolites, the alkoxyacids

P. Kučera, E. Cano, P. Honegger, B. Schilter, J. A. Zijlstra and B. Schmid 785 Validation of whole chick embryo cultures, whole rat embryo cultures and aggregating embryonic brain cell cultures using six pairs of coded compounds

H. C. Bowden, J. M. Tesh and F. W. Ross 799 Effects of female sex hormones in whole embryo culture

K. Miháliková, E. Ujházy, E. Braxatorisová and P. Kučera 803 Comparative teratological study of stobadin *in vivo* and *in vitro*

Session 4: Clinical Aspects

G. Van Maele-Fabry, P. Therasse, E. Lenoir, J. P. Desager, K. Despontin, G. Gofflot, M. C. Jacobs, C. Lecart, P. Berthet, J. M. Lachapelle and J. J. Picard 809 Embryotoxicity of human sera from patients treated with isotretinoin

R. Abir, A. Ornoy, H. Ben Hur, P. Jaffe and H. Pinus 817 IgG exchange as a means of partial correction of anomalies in rat embryos *in vitro*, induced by sera from women with recurrent abortion

J. Zhao, N. Krafft, G. D. C. Terlouw and R. Bechter 827 A model combining the whole embryo culture with human liver S-9 fraction for human teratogenic prediction

Forthcoming Papers 833